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ADP023976

TITLE: President's Malaria Initiative

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TITLE: Proceedings of the DOD Symposium on Evolution of Military
Medical Entomology

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President's Malaria Initiative

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Introduction

Malaria was the single most serious health hazard to Allied troops in the South Pacific area during World War II. It caused up to five times as many casualties as combat. Some 100,000 Allied military personnel contracted malaria in the South Pacific, most more than once. On Guadalcanal, in the Solomon Islands, this disease threatened the success of the military campaign.

Due to the presence of U.S. military personnel around the world and because of our experience with malaria, military entomologists are often expected to confront this and other vector-borne diseases. Although force health protection is our primary mission, many operations are humanitarian in nature and require working with host country ministries of health. These efforts are usually of short duration and range from small-scale control operations designed to prevent epidemics, to training of in-country public health staff.

The background that enabled me to work with the President's Malaria Initiative (PMI) was research that I conducted while stationed at U.S. Naval Medical Research Unit No. 2 (NAMRU-2), located in Jakarta, Indonesia. My first experience with malaria came via Initiative Antimalaria Indonesia (IAMI), which was a project funded by the U.S. Agency for International Development (USAID) to train health workers in the diagnosis and control of malaria. I also participated in several malariometric surveys in support of anti-malarial testing studies being conducted at

NAMRU-2. Additionally, I completed several projects on the bionomics and ecology of *Anopheles* in West Java, Indonesia, and led numerous *Anopheles* surveys throughout the country (e.g., on the island of Simeulue, funded by Save the Children, U.S.).

President's Malaria Initiative

The PMI is a collaborative U.S. Government effort led by the USAID in conjunction with the Department of Health and Human Services (DHHS), the Centers for Disease Control and Prevention (CDC), the Department of State, the White House, and others. The PMI assists National Malaria Control Programs (NMCPs) in each target country to achieve the President's goal of cutting malaria-related deaths by 50 percent. This goal will be attained by reaching 85 percent of the most vulnerable groups – children under 5 years of age and pregnant women – with proven and effective prevention and treatment tools. PMI funding for fiscal year (FY) 2006 was \$30 million; it rose to \$135 million in FY 2007, will increase to \$300 million in each of FYs 2008 and 2009, and to \$500 million in FY 2010.

The countries that received PMI funds during FY 2006 were Angola, Tanzania and Uganda. In FY 2007 programs in Malawi, Mozambique, Rwanda and Senegal were initiated, and in FY 2008 the PMI launched operations in Benin, Ethiopia (Oromia Region), Ghana, Kenya, Liberia, Madagascar, Mali and Zambia.

There are several strategies employed by the PMI to meet its stated goals: 1) spraying the insides of households with insecticides using indoor residual spraying techniques (IRS); 2) providing Long-Lasting Insecticide-Treated Mosquito Nets (LLITNs); 3) distributing lifesaving drugs based on the country's malaria treatment policy; and 4) supporting preventive treatment of malaria for pregnant women ("intermittent preventive treatment," or IPT).

In 2007 I was assigned to the team that assists Malawi. The team includes members from USAID Washington, USAID Malawi, CDC Atlanta, and US CDC Malawi. Malawi is a country in southeastern Africa with a population of approximately 13.9 million. The life expectancy at birth is 44 years for men and 43 years for women. Fully 100% of the population is at risk for malaria, although it is unknown whether true urban transmission of malaria is occurring in the capital city of Lilongwe or the largest city, Blantyre. The under-5 mortality rate is 120/1000, or approximately 1 in 8 children. Malawi has a National Malaria Control Program that is staffed with very capable and hardworking individuals. PMI is working closely with these dedicated people to develop a Malaria Control Plan that augments rather than duplicates their efforts.

Entomology and the PMI

My focus on the Malawi team is the entomology portion of the program. In Malawi PMI supported the first IRS round in Nkhotakota Malawi, covering 28,308 houses. The Ministry of Health National Malaria Control Program in Malawi plans to greatly expand IRS to seven districts, covering 500,000 houses

and an estimated population of 2.5 million people this year. The PMI's role in this expansion of IRS will be to spray the entirety of Nkhotakota District (approximately 53,000 houses). In addition to spraying Nkhotakota district, PMI will continue entomological monitoring and surveillance, including vector assessments and insecticide resistance testing in designated NMCP IRS scale-up districts to monitor the efficacy of both ITN and IRS. The Malaria Operation Plan for Malawi, and those of the other 14 countries covered under the PMI, is posted at <http://www.fightingmalaria.gov/countries/mops/index.html>.

We use several techniques to measure the effectiveness of IRS. Pyrethrum Spray Catches (PSCs), where insecticide is sprayed inside a house and the dead mosquitoes are collected on sheets that cover the floor, have been carried out in sprayed and unsprayed villages and provide a coarse picture of IRS effectiveness. World Health Organization cone bioassays are the standard technique that the PMI uses to determine effectiveness. A colony of *Anopheles gambiae* has been established at the Malaria Alert Center in Blantyre, Malawi, to provide material to carry out the assays. In addition, we have partnered with the Malawi College of Medicine, Malaria Alert Center, in a window exit trap study to measure the bionomics and resistance status of vectors both inside and outside the IRS area.

Conclusions

In my opinion, IRS is effective in reducing *Anopheles* numbers, and entomological monitoring is crucial to recognizing the success of the program. With pyrethroids applied to walls and

incorporated into LLITNs, the long-term effectiveness of these chemicals is a concern to control personnel. Entomological monitoring allows us to measure the length of time that insecticides are effective under local environmental conditions and to recognize insecticide resistance in vector populations.